

**Fire-related germination cues for soil-stored
seedbanks of fire-prone habitats in the
Sydney region, Australia**

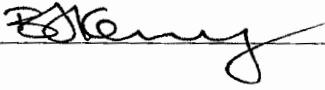
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2003

CERTIFICATE OF AUTHORSHIP / ORIGINALITY

I certify that this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

A handwritten signature in black ink, appearing to read "B. K. M.", is written over a horizontal line.

ACKNOWLEDGEMENTS

I would like to thank my supervisors, David Morrison and Tony Auld for guidance on experimental design and statistical analysis, helpful discussion on interpretation, constructive criticism of the text, and extreme patience shown in waiting for the production of this thesis. I would also like to thank Rod Buckney for taking up the role of principal supervisor after David moved to Sweden, and guiding me through the thesis submission process.

Financial assistance was provided by the Australian Research Council through an Australian Postgraduate (Industry) Award scholarship. Research funds were provided by the NSW National Parks & Wildlife Service and the Department of Environmental Sciences (UTS). Additional funding for conference presentations was provided by the UTS Vice Chancellors Conference Fund. Final printing of the thesis was courtesy of the NSW Rural Fire Service, Wyong District.

Field work and material collection was conducted on NSW NPWS estate under the conditions of a scientific research licence. I wish to thank local NPWS staff for assistance with information on fire history and site details, especially Mary Goshn, Ken Brown and Sandy Whight.

Thanks also to my work mates at NPWS Biodiversity Research Group, especially Mark Ooi (for field assistance and helpful discussion), Liz Sutherland (for good advice on thesis writing and life), and Meredith Henderson and Liz Tasker (fellow members of the NPWS thesis support group). A very big thankyou to Ross Bradstock for allowing me to take study leave for thesis writing, and for encouragement and inspiration.

Many thanks go to Kirsten Knox for assisting with field work (even on days hot enough to melt Gummi Bears and boot glue) and helpful discussion. Love and hugs to my fellow postgrads - Grant Hose, Cate McLinnis, Geoff McFarlane, Scott King, Amani Ahmed, Matthew Lockett, and Judy Upston - for support, distraction and the lovely Kylie book. Thanks to the staff of UTS - Narelle Richardson, Al Statz, Gemma Armstrong, Ed Soliman, and Greg Hampshire - for technical support.

Eternal gratitude to Sam Kenny for lab assistance, editing, emotional support, giving me the freedom to pursue my goals, and an unerring faith that I would eventually finish this thesis.

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ABSTRACT

Approximately 89% of species in fire-prone vegetation types of the Sydney region are assumed to have a soil seedbank. While a post-fire germination pulse is common for such species, the mechanisms involved in fire-related dormancy breaking are known for very few species in the region other than legumes.

The effects of the fire-related germination cues provided by soil heating and combustion products (smoke and charred wood) have been studied on numerous plant taxa in several regions of the world. However, these different cues have rarely been studied in combination.

The general aim of this thesis was to investigate the effect of fire-related germination cues on a variety of soil seedbank species of the Sydney region. This involved exploring methods of laboratory application of three fire-related cues (heat, smoke, and charred wood); assessing the individual and interactive effects of these cues on germination response (dormancy breaking) in laboratory, glasshouse and field trials; and examination of how these cues are received by soil-stored seeds.

Charred wood was found to have little effect on the germination of studied species, though the effects were very sensitive to the method of charred wood application. While half of the species studied were found to have a smoke cue, few of these responded to smoke only. Most species with only a smoke cue were sensitive to high temperatures (heat treatment was lethal or inhibitory).

One quarter of species had a heat cue only, most of these possessing a hard seed coat. A number of species without hard seed coats were also found to respond positively to heat, though these species also responded to smoke. The greatest proportion of studied species fell into the category of having germination stimulated by both heat and smoke. Among these species there was an even division into species with an equal germination response to both cues, an additive effect when the two cues are applied simultaneously, and a response only when the two cues are applied together.

The consequences of the different germination responses found are discussed in terms of the range of fire conditions likely to stimulate recruitment. Relationships were sought between functional types (fire response and seed traits) and these germination responses in order to explain the recruitment outcome of different fire regimes. It was found that the species showing a germination response that would allow germination under the widest range of fire conditions were those for which seedling recruitment is most critical after each fire event.